Centre for International
Governance Innovation

CIGI Papers No. 223 – July 2019

Data Is a Development Issue

Susan Ariel Aaronson

Centre for International
Governance Innovation

CIGI Papers No. 223 — July 2019

Data Is a Development Issue

Susan Ariel Aaronson

CIGI Masthead

Executive

President Rohinton P. Medhora
Chief Financial Officer and Director of Operations Shelley Boettger
Director, Global Economy Robert Fay
Director, International Law Oonagh Fitzgerald
Director of Human Resources Laura Kacur
Managing Director and General Counsel Aaron Shull
Director of Communications and Digital Media Spencer Tripp

Publications

Publisher Carol Bonnett
Senior Publications Editor Jennifer Goyder
Senior Publications Editor Nicole Langlois
Publications Editor Susan Bubak
Publications Editor Patricia Holmes
Publications Editor Lynn Schellenberg
Graphic Designer Brooklynn Schwartz
Graphic Designer Melodie Wakefield

For publications enquiries, please contact publications@cigionline.org.

Communications

For media enquiries, please contact communications@cigionline.org.

@cigionline

Printed in Canada on Forest Stewardship Council® certified paper containing 100% post-consumer fiber.

Centre for International Governance Innovation and CIGI are registered trademarks.

Centre for International
Governance Innovation

67 Erb Street West
Waterloo, ON, Canada N2L 6C2
www.cigionline.org

Table of Contents

About the Author

Susan Ariel Aaronson is a CIGI senior fellow. She is an expert in international trade, digital trade, corruption, good governance and human rights. Susan writes on digital trade for CIGI.

In addition to her work at CIGI, Susan is research professor of international affairs and GWU Cross-Disciplinary Fellow at the George Washington University's Elliott School of International Affairs. At GWU, Susan recently completed a global project funded by the Hewlett Foundation that examined whether nations can find shared norms, definitions and strategies to reduce barriers to cross-border data flows. She was the former Minerva Chair at the National War College.

Susan is the author of six books and numerous articles. Her work has been funded by major international foundations including the MacArthur Foundation, the Ford Foundation and the Rockefeller Foundation; governments such as the Netherlands, United States and Canada; the United Nations, International Labour Organization and the World Bank; and US corporations including Google, Ford Motor Company and Levi Strauss & Co. Susan is also a frequent speaker on public understanding of globalization issues and international economic developments. She has often provided background and commentary on *Marketplace* radio and was a monthly commentator on *All Things Considered* and *Morning Edition*. Susan has appeared on CNN, CBC, the BBC and NPR to discuss trade and globalization issues. From 1995 to 1999, she was a guest scholar in economics at the Brookings Institution, and from 2008 to 2012 she was a research fellow at the World Trade Institute. In her spare time, Susan enjoys triathlons and ballet.

About Global Economy

Addressing the need for sustainable and balanced economic growth, the global economy is a central area of CIGI expertise. The Global Economy initiative examines macroeconomic regulation (such as fiscal, monetary, financial and exchange rate policies), trade policy and productivity and innovation policies, including governance around the digital economy (such as big data and artificial intelligence). We live in an increasingly interdependent world, where rapid change in one nation's economic system and governance policies may affect many nations. CIGI believes improved governance of the global economy can increase prosperity for all humankind.

Executive Summary

Many wealthy states are transitioning to a new economy built on data. Individuals and firms in these states have expertise in using data to create new goods and services as well as in how to use data to solve complex problems. Other states may be rich in data but do not yet see their citizens' personal data or their public data as an asset. Most states are learning how to govern and maintain trust in the data-driven economy; however, many developing countries are not well positioned to govern data in a way that encourages development.

Meanwhile, some 76 countries are developing rules and exceptions to the rules governing cross-border data flows as part of new negotiations on e-commerce, which the World Trade Organization (WTO) defines as the "production, distribution, marketing, sale or delivery of goods and services by electronic means." The 76 countries come from every continent and represent a good mix of wealth, size and internet expertise. Most of the participating nations have e-commerce companies or companies that operate online.

The main demandeurs of these talks are countries such as Brazil, Canada, China, the United Kingdom and the United States. Policy makers in these nations recognize that they need economies of scale and scope for data to build data-driven sectors. To achieve economies of scale and scope, they need either large populations that are online or access to citizens in other countries through trade agreements. These officials see the negotiations as an opportunity to reconcile domestic rules governing how various types of data are used and controlled with international trade rules governing cross-border data flows.

This paper uses a wide range of metrics to show that most developing and middle-income countries are not ready or able to provide an environment where their citizens' personal data is protected and where public data is open and readily accessible. Not surprisingly, greater wealth is associated with better scores on all the metrics. Yet, many industrialized countries are also struggling to govern the many different types and uses of data. The paper argues that data governance will be essential to development, and that donor nations have a responsibility to work with developing countries to improve their data governance.

Introduction: Developing Countries and Data

Indian officials have a clear-eyed view of their nation's future, and they see that future could be built on data. In March 2019, they issued a draft national e-commerce policy that delineated how India could use data to stimulate economic growth, how personal data would be protected and how India's approach would attract investment and build trust (Government of India 2019).

The authors of the plan stressed that "India has the second largest population in the world, with a young, consumer-oriented society." As a result, India "is emerging as a virtual treasure trove of information. India is likely to become one of the largest sources of commercially useful data in the world" (ibid., 6). They concluded that with this vast data market, India can ensure that its citizens have greater control over their data, and Indian firms can use this data to create jobs and new products and services.

India resembles many developing countries: only 560 million people, or 46 percent of its population, are active online; thus, there is plenty of room for domestic growth.[1] However, India differs from many developing countries because it has long relied on data (software exports and outsourcing) to fuel export-led growth. India's success in data was built on many factors, including supportive government policies; excellent math and computer science education at the university level; highly educated and fluent English-speaking workers that accept relatively low wages compared to other nations; lower infrastructural costs; and the Indian diaspora in the United States, which helped Indian companies gain clients and funding from US and other multinationals (Bhattacharje and Chakrabartib 2015, 30–32; Cohen 2019).

India also has another big advantage: as the second-most populous country in the world, it has leverage over the big data firms based in the United States and China. One 2017 study described India as "the greatest potential market for global players" (Chakravorti, Bhalla and Chaturvedi 2017).

1 See www.statista.com/statistics/265153/number-of-internet-users-in-the-asia-pacific-region/.

Most developing and middle-income countries do not share India's attributes: they have smaller populations and they relied upon a different approach to growth. Policy makers in these nations are focused on a more traditional approach to growth: building jobs through manufacturing diversification rather than data, which requires a highly skilled computer-literate workforce, as well as capital and high-tech infrastructure (United Nations Conference on Trade and Development [UNCTAD] 2017b and World Bank 2018). Some developing country officials understand they could miss out on the opportunities provided by this new economy, and they are investing in infrastructure, data plans and strategies to boost artificial intelligence (AI) and other cloud-based sectors. But others have not yet woken up to this challenge — they must get up to speed fast. Some 76 countries are now participating in negotiations at the WTO to set up rules to govern e-commerce — these talks seem likely to include rules to govern data-driven services. The other 88 members of the WTO can choose not to participate in these talks, but then they will not be a part of shaping the rules that will affect both foreign and domestic data flows. Interestingly, India is one of those countries.

In recognition of this dilemma, this paper attempts to explain why data governance is a development issue. First, the economics and politics of data are discussed. The types of data governance policy makers will need to develop are then reviewed and the divisions over the trade talks at the WTO are briefly described. A wide range of metrics are used to describe both developing country data governance and the ability of these countries to use data to stimulate development. Countries with higher levels of wealth are more likely to do a better job of using data to fuel development. At the same time, the data reveals that industrialized countries also struggle to govern the many different types of data. Examples of data governance problems in the developing and industrialized world are then illuminated. Finally, the paper concludes and makes some suggestions for policy-maker action.

The Economics and Politics of Data

In countries active in the data-driven economy, firms are creating new products and services built on various types of data — often combining data sets and gaining new insights about how people and systems behave. If a firm operates in a country with a large population where lots of people are online, that firm can achieve economies of scale in data from its local clients. Another way to achieve economies of scale in data is to participate in a system of rules such as a trade agreement that facilitates access to data from many countries.

Scholars are just beginning to try to understand this new economy and its governance. According to economist and CIGI Senior Fellow Dan Ciuriak (2018), the data-driven economy is built on "information asymmetries." Firms that have significant computing power are better positioned to extract and utilize data to create new products and services than firms that do not have such computing access. In addition, because data-driven firms must make large capital investments to exploit big data sets, information asymmetry also applies across firms (ibid.).

These big firms (such as Google, Amazon, Alibaba and Tencent) already have an advantage. The more data they have, the more easily they can use algorithms to transform raw data into new value-added data products. They can then sell these products along with existing products. These new products and services generate even more data, which, in turn, further perpetuates the market power of these firms (Weber 2017, 411).

Information asymmetry also applies across countries. In its 2016 annual development report, the World Bank stated that despite the widespread dissemination of digital technologies, many developing countries have not yet been able to benefit (World Bank 2016). To a great extent, developing countries do not have the expertise, capital or infrastructure to nurture data-driven firms. Most of the firms transitioning to this new data-driven economy are in middle-income and wealthy countries (WTO 2018).

Although the fastest-growing markets for data-driven services are in the developing world,

developing countries are not capturing much of its value. Apps provide an interesting example. Using 2015 statistics, Caribou Digital (2016, 6) reported:

> Developer participation in the app economy is heavily skewed toward the largest and richest economies, with the United States, Japan, and China dominant. Because the app markets function as winner-take-all markets, the top-ranked apps in the most-lucrative markets earn multiple orders of magnitude more revenue than low-ranked apps in markets of the Global South. The result is that 95% of the estimated industry value is being captured by just the top 10 producing countries. For lower-income countries, the outlook is relatively bleak: Most have very few developers, and even those who had significant numbers of developers — for example, India — earned very little revenue; as a group, the 19 lower-income countries in our sample earned an estimated 1% of global app economy revenues.

The authors concluded that developers in developing countries may gain domestic market share, but they struggle to export their products (ibid., 8).

Many analysts believe that the United States and China already have comparative (and possibly absolute) advantage in data-driven sectors (UNCTAD 2017b; Lee 2018; Zwetsloot, Toner and Ding 2018). Recent statistics bear this out. Of the 25 largest internet companies in 2017 by revenue, 13 are in the United States, while four are in China. Germany, India, Japan, the Netherlands, Russia, South Korea, Spain and the United Kingdom each have one top performing firm.[2] The top 20 companies by valuation were either Chinese or American, according to 2017 data (Desjardins 2018). The United States has some 51 percent of cloud storage as of 2017, but it is expected to decrease to 31 percent in 2025 while China's share is predicted to grow from six percent in 2017 to 13 percent in 2025 (Reinsel, Gantz and Rydning 2018). *The Economist* reported in 2016 that US firms have more than 80 percent of the profits of internet platform companies, while European firms have only five percent (*The Economist* 2016). These top-performing firms not only have massive amounts of data to analyze and develop new goods and services, but they also have access to patient capital to invest in these new goods and services. It should be noted, however, that no advantage can last forever, as times, technology and markets change.

Researchers, government officials and investors may have a harder time building data-driven sectors in developing countries where they are hobbled by a wide range of obstacles. These impediments include unstable internet connections, limited funding, low numbers of highly skilled workers and inadequate infrastructure (Onifade 2018; Golobski 2018; Pinto 2018). Moreover, given these impediments, executives at data-driven firms are unlikely to see these countries as effective locales for their operations. At the same time, policy makers in the developing world instead focused on attracting foreign investment that creates many jobs, in particular for relatively unskilled workers (Ernst, Merola and Samaan 2018). Citizens, business leaders and officials from these countries may not see leapfrogging to a data-driven economy as the best way to stimulate development.

Meanwhile, although developing countries are rich in data, many developing-country officials do not yet see data as a resource. Without greater understanding of the economic and political use of data, these officials may hoard data or fail to advocate for their citizens' interest (Aaronson 2018). As a result, their citizens may miss an opportunity to use their data as leverage for development funding or economic diversification. Moreover, these same citizens do not own the infrastructure — instead, in many developing countries, the infrastructure is in the cloud and the cloud servers are located abroad — most likely in industrialized countries (Pinto 2018).

Unfortunately, countries that do not accommodate the data-driven economy may find their development suffers nonetheless. UNCTAD (2017b, 7) reports that these countries will be less well-positioned to trade without data-driven expertise. These countries may, over time, export their data, but because data is plentiful, it is unlikely to yield significant export earnings. At the same time, these nations will be importers of data-driven services, such as health-care protocols or consumer predictive analytics. Moreover, these states will need to use data

2 See www.worldatlas.com/articles/the-25-largest-internet-companies-in-the-world.html.

analytics to ensure that the other goods and services they produce remain competitive.

According to political scientist Steven Weber, many developing countries are not well-placed to address these problems. First, while data is cheap and plentiful, data analysis is expensive because it is dependent on infrastructure and highly skilled labour. Therefore, it is hard to build these sectors in countries where infrastructure is inadequate and the supply of highly skilled labour is small. Second, Weber argues that there are not enough incentives in many developing countries to create firms to conduct data analysis in lieu of importing data services. He also believes that citizens in the developing world greatly desire data-driven products and services, such as Facebook. These citizens "comprise a ready constituency within Country X to lobby against 'import restrictions' or tariffs" (Weber 2017, 410). Moreover, "since data products generate more data as they are used, the greater...data imbalance would become over time" (ibid., 411).

Weber posits a potential bleak future: the countries with large data pools and data analysis expertise become a core, while those without data expertise could become the periphery. These states could, over time, become less capable of developing further innovation (ibid., 412-13). Along these lines, the World Bank warned that to get the most out of the digital revolution, countries also need to strengthen regulations that ensure competition among businesses, by adapting workers' skills to the demands of the new economy and by ensuring that institutions are accountable (World Bank 2016). UNCTAD warned that digitalization could also lead to increased polarization and widening income inequalities, as productivity gains may accrue mainly to a few, already wealthy and skilled individuals. Consequently, UNCTAD suggested policy makers should deepen their understanding of the issues at the interface of trade logistics, digitalization and e-commerce (UNCTAD 2017b, 2).

Three Types of Data and Data Governance

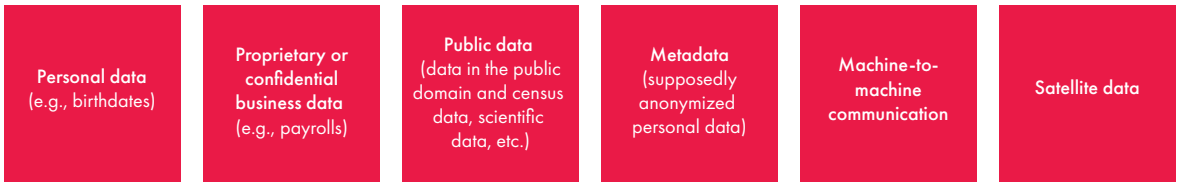
Researchers, firms and governments increasingly use data to answer questions, solve problems or lower costs. To build data-driven services or products, engineers need lots of data (data volume), a variety of data (data variety) and good data that is correct (data quality and veracity) (TechNative 2018; Leetaru 2019). Many data-driven services are built on access to large databases containing personal data, which people provide in return for free online services, such as Google Translate, as well as those they pay for, such as Netflix. As systems learn from the data provided, that data may be utilized in different ways for multiple purposes, some unrelated to the needs of that person (Datatilsynet 2018; Aaronson 2018). Figure 1 describes six different types of data. Herein the discussion focuses on three of these six — proprietary data, public data, and personal data, including metadata — different types of data that are widely used in data-driven services.

Most countries have rules governing the use of proprietary data at the national and international levels, and many have rules governing the use of personal data as well. But policy makers and their constituents are just beginning to develop rules governing how firms can utilize, mix and monetize various types of data.

Proprietary data is generally data that has been generated by a company that allows it to control and safeguard its competitiveness over other companies. Proprietary data is protected by copyright laws, patent laws and trade secrecy laws.[3] However, as the head of the World Intellectual Property Organization notes, the public good nature of data challenges the notion that data should be proprietary. In a 2018 interview, Francis Gurry noted, "The 'open' movements for science, data, and publication, for example, favor the view that data should not have proprietary categories placed on them. They argue that...it should be freely available to enable the development of AI and other applications.... Lines will have to be drawn between the need to keep channels of data open and flowing, on the one hand, and the need to close them to ensure

3 See https://thelawdictionary.org/proprietary-data.

Figure 1: Types of Data



Source: Author.

the right incentives are in place for the creation of new knowledge, on the other hand" (Gurry 2018).

The new data-driven economy is also leading some researchers to challenge how policy makers regulate the use of public data. Public data can be defined as information collected, produced or paid for by public bodies. Public data is essential to good governance and democracy, and much of the data governments collect and assess should be in the public domain (BSA 2018; McKinsey & Company 2017; World Policy 2013). However, government officials have the right to limit access to data that is private or that should be kept secret for national security reasons (Ransbotham 2015; World Policy 2013). Advocates of open government and open data believe that researchers (whether in the public, private or academic sectors) should have easy and free access to public data. Moreover, they increasingly argue that public data should be provided in a machine-readable form, so it can be easily utilized by computer programs.[4]

Researchers and policy makers are perhaps most challenged by the need to protect personal data, which can be found in almost every type of data (Aaronson 2018). Nations have divergent definitions of personal data (Girot 2018; DLA Piper 2019). For example, the European Union defines personal data as any information that relates to an identified or identifiable living individual. Personal data may be directly linked to a person or indirectly linked to a person (for example, when you can use a year of Amazon purchases to guess a person's identity).[5] In contrast, the US government describes personal information as data that can reasonably be used to contact or distinguish a person, including IP addresses and device identifiers (DLA Piper 2019). Although policy makers are working to put forward interoperable strategies to manage cross-border data flows, there does not appear to be a movement to find a shared definition of personal data.

Moreover, policy makers are struggling to regulate the many types of data that could include or reveal personal information. Metadata can be defined as data that provides information about other data. While metadata is often harmless, it can potentially include sensitive, confidential or privileged information. A determined researcher could identify personal data from just one piece of information. The European Union considers metadata, including metadata without an obvious identifier, as personal data that must be protected under the General Data Protection Regulation. Many countries, including Australia and Canada, are still reckoning with this issue. In 2015, the Australian Privacy Commissioner determined that URLs, IP addresses and mobile geolocation signals were all metadata; some of this could be subject to privacy laws.[6] Canadian data protection law does not explicitly address metadata, but the Privacy Commissioner warned that some courts have recognized that metadata can reveal much about an individual and deserves privacy protection. However, the Privacy Commissioner also warns that context matters (Office of the Privacy Commissioner of Canada 2014).

Given the complexities of data governance, perhaps we should not be surprised that many developing countries have not adopted effective rules to protect personal data online. UNCTAD reports that, based on 2018 data, 58 percent of countries (107 nations of which 66 were developing or transition economies) have put in place legislation to secure the protection of data and privacy. Some 21 percent of countries surveyed have no law, 10 percent are

4 For example, see http://data.europa.eu/euodp/en/about.

5 See https://ec.europa.eu/info/law/law-topic/data-protection/international-dimension-data-protection/adequacy-decisions_en.

6 On the European Union, see https://eugdprcompliant.com/personal-data/. On Australia, see Newman (2019).

Box 1: What Do We Mean by Data Governance?

To govern data effectively, policy makers should talk with their constituents about their concerns about data. Specifically, they should discuss how various types of data should be governed, what kinds of data should and should not be shared, how data can move from one platform to another, how data can flow to other countries and how various types of data such as personal and proprietary data can be combined and utilized by private firms or governments. Many countries, including India and Canada, have tried to engage their citizens in addressing some of these issues. Although it is too early to assess the success of Canada's efforts, Canada provides a good model of how a government might create a feedback loop between its citizens, firms and policy makers on data governance.

Background: In 2018, the Canadian government held 30 round tables with some 580 participants who came up with almost 2,000 ideas. Building on those recommendations, in May 2019, it announced a Digital Charter for Canada based on 10 principles:

1. Universal Access
2. Safety and Security
3. Control and Consent
4. Transparency, Portability and Interoperability
5. Open and Modern Digital Government
6. A Level Playing Field
7. Data and Digital for Good (in an ethical manner)
8. Strong Democracy
9. Free from Hate and Violent Extremism
10. Strong Enforcement and Real Accountability (Government of Canada 2019a and 2019b).

Effects: By adhering to principles put forward by the Canadian people, the Canadian government hoped to achieve three objectives: maintain trust online; foster growth by supporting the data-driven economy; and show the world that it understood and would try to address some of the negative spillovers (such as disinformation) of the data-driven economy.

in the process of drafting legislation and there was no data for 12 percent of the countries reviewed.[7]

As these paragraphs reveal, as firms, governments and individuals increasingly rely on data to produce goods and services, data governance has become an important element of governance. As Box 1 illuminates, data governance is not easy.

Finally, to be useful, all types of data must be archived and stored in ways that enable researchers to use that data and combine it with other data sets in a cost-effective manner. Much of the world's data today is stored in the cloud (large corporate data centres with sophisticated computers that provide computing and storage as a service). The research firm IDC estimates that some five billion consumers interact with data stored in the cloud every day — much of this interaction is through devices (Reinsel, Gantz and Rydning 2018).

The big cloud companies, such as Amazon, Alibaba, Microsoft and IBM, have servers in many countries. But the data stored in the cloud is difficult to govern because the individual, government or thing providing the data may be in country A, the data may be stored in country A or B and it may

7 See https://unctad.org/en/Pages/DTL/STI_and_ICTs/ICT4D-Legislation/eCom-Data-Protection-Laws.aspx.

be processed in country B or C. Some countries have laws governing data in the cloud, but others are just beginning to adopt such laws. These laws and regulations are works in progress — there are many grey areas and legal questions, such as when we consider data to be exported. Moreover, countries have developed a patchwork rather than an interoperable approach to domestic laws governing data in the cloud (BSA 2018). But policy makers and business leaders in some countries believe that multilateral trade agreements may be a good place to reconcile these approaches and to govern cross-border data flows.

Why the Urgency? How e-Commerce Talks May Be Morphing into Talks on Data Governance

Many countries will be under increasing pressure to determine their regulatory approach to data because, as noted above, the WTO has invited member states to participate in e-commerce talks. Trade agreements such as the WTO regulate data by regulating the provision of cross-services built on data, such as data processing and other computing services (Burri 2017; Drake 1993). Trade agreements can affect data-driven services in several ways: by enabling the creation of large global training data sets; by defining and limiting how and when nations can put in place barriers to cross-border data flows; by clarifying how and when governments can demand access to algorithms that may be proprietary; and by limiting forced technology transfers of intellectual property (Aaronson 2018; Meltzer 2018).

WTO members first began to discuss how to regulate cross-border e-commerce in 1995, and early on they developed a broad definition that could encompass new data-driven services. According to the WTO Secretariat: "the term 'electronic commerce' is understood to mean the production, distribution, marketing, sale or delivery of goods and services by electronic means."[8]

After two decades of fits and starts, members finally made progress. On January 25, 2019, 76 WTO members agreed to commence e-commerce talks: "we will seek to achieve a high standard outcome that builds on existing WTO agreements and frameworks with the participation of as many WTO members as possible" (Kanth 2019). The announcement was not greeted with universal acclaim. While business groups lauded the announcement, civil society organizations and international labour groups have come out against the talks, citing concerns that they could lead to a deal that would entrench the power of large corporations and threaten jobs, privacy and data security (Monicken 2019).

Interestingly, these talks have revealed some interesting divisions among states regarding data governance (*The Economist* 2019). The negotiating parties represent an interesting mix of industrialized and developing countries, democratic and authoritarian states, and countries with active data-driven sectors and those without.

Many states, including Australia, Brazil, Brunei, Canada, China, Chinese Taipei, the European Union, Georgia, Hong Kong, Iceland, Japan, Kazakhstan, Korea, Liechtenstein, Macedonia, Moldova, Mongolia, Montenegro, New Zealand, Norway, Russia, Singapore, Switzerland, Thailand, Ukraine and the United State, are keen to move these talks forward. Meanwhile, while China has many digital firms that are keen to serve consumers in other countries, Vietnam and Russia — countries with authoritarian governments and less active digital sectors — are also participating.

However, WTO members disagree on the purpose and scope of the talks. While Brazil, Canada, the European Union and the United States generally want to create interoperable and universal rules and limit barriers to such flows, Russia and China are more concerned with maintaining internal social and political stability and are more open to using domestic regulation to limit such flows (Aaronson and LeBlond 2018; Sacks 2018; Herold 2011; Drake 2018, Organisation for Economic Co-operation and Development [OECD] 2015).

Policy makers and business leaders in most countries acknowledge that e-commerce could help their farmers and firms trade directly with consumers around the world (eBay Inc. 2013; UNCTAD 2018; UNCTAD 2017a). While they are willing to negotiate "e-commerce," many are leery

8 See www.wto.org/english/tratop_e/ecom_e/ecom_e.htm.

of negotiating data-driven services, given that they may lack domestic data-driven firms. Nonetheless, in its most recent proposal, dated April 2019, the United States titled its statement "WTO Agreement on Digital Trade," rather than e-commerce. The US proposal not only included language governing personal information protection, but it also included the first language regarding open government data. It encouraged members to endeavour that such information be provided in a machine-readable format so it "can be searched, retrieved, used, reused, and redistributed" (WTO 2019). Many developing countries responded to the US proposal with increased concern about losing control over their public and personal data. At UNCTAD, five nations called for infant industry protections for data, to ensure that developing countries could create data-driven sectors.[9]

To better understand these concerns, the next section gives a broad overview of the data governance policies and potential in 42 low, lower-middle and upper-middle countries. For the purpose of brevity, these states are labelled "developing countries," although they have many differences in income, locale, factor endowments and development strategies.[10]

Analysis

The research strategy was designed to capture a broad and representative sample of developing country capacity on data. Two types of analysis were carried out: average scores for the 42 states on four key metrics and country-specific analysis on multiple metrics. Forty-two countries were chosen from the World Bank listing of low-income, lower-middle and upper-middle countries. There was an attempt to broadly represent various world regions as described by the bank.[11] The World Bank classifies 34 countries as low income; 47 as lower-middle income; 56 as upper-middle income; and the remaining 81 as high income.[12] The 42 states represent 31 percent of all developing states (the 137 countries that are classified as either low, lower-middle or upper-middle income). The 42 countries were then divided into three income groups with 14 in each group. This division makes it possible to see if income is associated with better performance on various metrics of data governance. The analysis then relied on the Economist Intelligence Unit to classify each country by type of regime. The Economist Intelligence Unit divides countries into four groups: full democracies, flawed democracies, authoritarian regimes and hybrid regimes. Full democracies are nations where civil liberties and basic political freedoms are thriving. Flawed democracies are nations where elections are fair and free and basic civil liberties are honoured, although these countries may have significant faults in other democratic aspects. Authoritarian regimes are nations where political pluralism has vanished or is extremely limited. These nations are often absolute monarchies or dictatorships. These states may have some conventional institutions of democracy, but observers often find abuses of civil liberties. Hybrid regimes often do not conduct free and fair elections. These nations suffer from widespread corruption, media harassment, anemic rule of law and more pronounced faults than flawed democracies (Economist Intelligence Unit 2016, 1). With this analysis, it is possible to get a better understanding as to whether more democratic governments are better positioned to govern data.

Table 1 delineates the governance mix among the sample and, in turn, the type of governance structure tells us something about how policy makers in that country view data. The sample did not include any full democracies, but comprised a mix of hybrid, authoritarian and flawed democracies. Interestingly, none of the low-income economies in the sample participate in a trade agreement with binding provisions on data. However, one of the middle-income economies (Vietnam) participates in such a trade agreement, and three of the upper-middle-income countries (Malaysia, Mexico and Peru) participate. These

9 Author observations at UNCTAD e-commerce week, during discussions with UNCTAD delegates. For information on the conference, see https://unctad.org/en/Pages/MeetingDetails.aspx?meetingid=1966 and https://eweek2019.unctad.org/meetings?classes[]=Groups%3A%3AMeetings%3A%3AMeeting.

10 The World Bank classifies economies into four income groupings: low, lower middle, upper middle and high. Income is measured using gross national income (GNI) per capita, in US dollars, converted from local currency using the World Bank Atlas method. Estimates of GNI are obtained from economists in World Bank country units; and the size of the population is estimated by World Bank demographers from a variety of sources, including the UN's biennial World Population Prospects. See https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

11 See https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

12 Ibid.

Table 1: Income Category and Governance Type

	World Bank Low-income Economies ($995 or less)	World Bank Lower-middle-income Economies ($996 to $3,895)	World Bank Upper-middle-income Economies ($3,896 to $12,055)
Flawed Democracy	Senegal	Ghana India Indonesia Philippines Tunisia	Brazil Colombia Jamaica Malaysia Mexico South Africa
Hybrid Regime	Benin Liberia Madagascar Nepal Tanzania Uganda	Bangladesh Bolivia Georgia Honduras Morocco Nicaragua Nigeria Pakistan	Armenia Ecuador Peru Thailand
Authoritarian Regime	Ethiopia Gambia Guinea Haiti Tajikistan Yemen Zimbabwe	Vietnam	China Equatorial Guinea Gabon Russia

Source: Analysis by Kailee Hilt.

four countries are in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). These nations have agreed to provisions that make the free flow of data among members a default and to language requiring them to put in place some nationally appropriate regulations for protecting personal data (Aaronson 2018).

The Importance of Human Capacity to Effective Data Collection and Analysis

The first metric utilized is the Global Human Capital Report know-how sub-index, which is a perception-based metric developed by the World Economic Forum. Perception metrics are based on expert surveys of a country's conditions. Analysts ask these experts a wide range of questions and then aggregate the answers into one numerical assessment. This sub-index measures a country's ability to develop and utilize a highly skilled work force. Hence, it tells us something about whether a country has enough expertise to build data-driven sectors such as AI. The World Economic Forum noted that "the leaders of the Index are generally economies with a longstanding commitment to their people's educational attainment. Unsurprisingly, they are mainly today's high-income economies" (World Economic Forum 2017, vii). Countries are ranked on a scale of 1–100. Most developing countries do not do well on this metric, both individually and on average scoring some 15–20 points lower than wealthier countries. These countries may be focused on primary and secondary education in the hope that a generally literate population will attract foreign investment. If they want to encourage the data-driven economy, policy makers might want to rethink educational priorities.

Regulatory Governance in General Provides an Indicator of Data Governance

Next, each nation's regulatory governance was examined using a perception metric from the World Bank.[13] The Global Indicators of Regulatory Governance score measures the inclusiveness of regulatory rule-making processes and how policy makers interact with stakeholders when shaping regulations. The score ranges from 0 (worst performance) to 5 (best performance) and considers: publication of proposed regulatory plans; consultation on proposed regulations; reporting back on the results of the consultation process; regulatory impact assessments; and whether laws are made publicly accessible. The score reflects an understanding that good governance is not just about making regulations transparent but ensuring that the public can comment on regulations and that the government responds to public concerns about regulations. Governments that have such a give and take between policy makers and their constituents are better positioned to respond to economic and technological changes. Such states have higher levels of trust and compliance (Lindstedt and Naurin 2010; World Bank n.d., 3). On this metric, richer countries scored better than less wealthy countries, but there were some outliers. In a data-driven economy, policy makers can more easily be held to account and hence quality of governance may be relatively more important.

Statistical Capacity as a Metric of Producing Quality Data

Another World Bank perception-based metric relating to statistical capacity was then used.[14] This score assesses the capacity of a country's statistical system. The data set was limited to middle-income, emerging and developing countries and consequently developing countries could not be compared to the wealthiest countries. Countries are scored against 25 criteria in three categories: methodology, source data and periodicity. The overall Statistical Capacity Indicator represents the average score within the categories. If a government cannot collect, analyze and present public statistical data, it is unlikely to succeed in the data-driven economy.

Many nations do not have transparent and accountable rules for the governance of data gathered or held by governments, whether census data or even scientific data. Officials from these states seem to view public data as a strategic resource and believe that the government should control its use (Network Asia 2016; Hong 2017; Girot 2018, 6). In recent years, policy makers in a wide range of countries have learned how to map their data assets and how to manage them efficiently (Eaves and McGuire 2019; Verhulst and Young 2017). However, a growing body of research has shown that data collected by governments can have important spillover effects if it is verifiable and easy to utilize (for example, in machine-readable format). Public statistics can improve governance and reduce corruption, empower citizens by informing them, foster innovation and promote economic growth. Policy makers and researchers can also use these public data sets to solve governance problems.[15] For these reasons, statistical capacity is a leading indicator of the quality of data governance and the ability to produce verifiable public data.

The 42 countries in the sample had significant variance in their statistical capacity, but, in general, wealthier countries and flawed democracies have better average statistical capacity.

Open Data Index as a Metric for Using Public Data to Feed AI

The Open Data Index Score refers to the percentage of government data sets that are fully open, free and in machine-readable open file formats[16] (which makes them easy for computers to utilize). The "open score" refers to the percentage of data sets relating to government budget, national statistics, procurement, national laws, administrative bodies, draft legislation, air quality data, national maps, weather forecast, company register, election results, locations, water quality, government records and land ownership data that are fully open to the public. The "overall score" is weighted using specific survey questions relating to whether the data is available without having to register, free of charge, downloadable at once, up to date, openly licensed/in the public domain and in open file formats.

AI and data analytics sectors are likely to thrive in countries where there is a large supply of

13 See https://rulemaking.worldbank.org/.

14 See http://datatopics.worldbank.org/statisticalcapacity/Home.aspx.

15 See http://odimpact.org/.

16 https://index.okfn.org/place/.

open, verifiable, high-quality data. Hybrid and authoritarian regimes are not likely to ensure that their constituents have full access to data collected by the government about its citizens or to fully protect personal data. Wealthier countries are more likely to be democracies or flawed democracies. Democracies and flawed democracies are more likely to protect personal data and to provide data to their constituents. Richer regimes were more likely to score higher than lower-middle-income economies.

Table 2 examines the average performance by income on each of these four metrics. The chart reveals that richer countries generally score higher than lower- or middle-income economies.

The performance of the 42 countries was then compared with a sample of high-income economies from the United States, Canada and the European Union. As Table 3 shows, wealth was correlated with performance. Richer countries were significantly more open and consequently provided more data to solve problems and create wealth. Yet the figure also shows statistically significant differences among these wealthier states.

The Outliers

Several countries performed better than expected on key metrics that can be associated with effective governance of data. On global human capacity, Benin and Tajikistan, both low-income economies, had higher scores than most low-middle-income countries with the exception of the Philippines. These scores were also better than most upper-middle-income economies with the prominent exceptions of Jamaica, Malaysia, Mexico and Russia. On regulatory governance, Uganda stood out with a score higher than lower-middle-income economies with the exception of India and Morocco. Among upper-middle-income economies, Mexico, Russia and Thailand stood out for high performance on regulatory governance. On statistical capacity, Tajikistan and Tanzania, both low-income economies, stood out with scores in the upper 70s; India, Indonesia and Georgia stood out among lower-middle-income economies. Mexico, Peru, Thailand and Armenia had the highest scores in statistical capacity. Finally, on open data, Brazil, Colombia and Mexico stood out for good performance, while most lower-income developing countries performed poorly.

Mexico was the best performer on all metrics; this solid performance cannot be attributed simply to the influence of the United States and Canada, its neighbours and key trade partners. Mexico is a member of the OECD and the Group of Twenty (G20), and has long concurred with the wealthy state norms about openness and good governance. Mexico is also a signatory to the CPTPP, an agreement with binding data-flow provisions, but also to a trade agreement with the European Union (not yet in effect but with data-flow provisions). Mexico is active in the digital economy, excelling in app development (Popescu 2016; Di Ionnoy and Mandel 2016). Moreover, Mexico is also a standout in e-government and open government (Cesar et al. 2018; Aaronson 2017). The Mexican government hopes that by being open, the government will be less corrupt, more accountable and effective, and the country will become more productive.[17]

Country-specific Results: An Overview

A broader swatch of metrics were used to examine these developments at a more granular level. These metrics were divided into three groups: capacity (the ability of a nation and its people to create a data-driven economy); governance (the ability of a people and state to govern effectively and equitably); and then data plans and indicators (the actual rules and regulations related to the governance of public and personal data). These country-specific findings are available on the website of the Digital Trade and Data Governance Hub, www.datagovhub.org. The findings are briefly summarized below.

First, to determine capacity, this analysis relied on metrics of human know-how, the percentage of individuals using the internet, the percentage of fixed broadband subscriptions, the percentage of mobile telephone subscriptions per 100 inhabitants and the number of AI labs. Capacity and wealth were, in general, highly correlated. Low-income economies tended to have relatively low human capital and internet penetration, but most countries had some form of AI lab. However, there was no

17 See https://developmentseed.org/projects/mexico-con-datos/.

Table 2: Average Performance on Key Metrics by Income Group

Developing Countries	Average Know-how Sub-index Score (0–100)	Average Regulatory Governance Score (0 = worst, 5 = best)	Average Statistical Capacity Indicator Score (0–100)	Overall Global Open Data Index Score (Average)
Low-income economies ($995 or less) (Benin, Ethiopia, Gambia, Guinea, Haiti, Liberia, Madagascar, Nepal, Senegal, Tajikistan, Tanzania, Uganda, Yemen, Zimbabwe)	45.1	1.4	64.0	17.7%
Lower-middle-income economies ($996 to $3,895) (Bangladesh, Bolivia, Georgia, Ghana, Honduras, India, Indonesia, Morocco, Nicaragua, Nigeria, Pakistan, Philippines, Tunisia, Vietnam)	46.1	2.6	75.0	26.8%
Upper-middle-income economies ($3,896 to $12,055) (Armenia, Brazil, China, Colombia, Ecuador, Equatorial Guinea, Gabon, Jamaica, Malaysia, Mexico, Peru, Russia, South Africa, Thailand)	51.8	3.3	76.4	41.2%

Source: Kailee Hilt

Table 3: How Average Performance Compares to the Performance of Wealth

Country	Average Know-how Sub-index Score (0–100)	Average Regulatory Governance Score (0 = worst, 5 = best)	Average Statistical Capacity Indicator Score (0–100)	Overall Global Open Data Index Score (Average)
Canada	65.9	5.0	No data	69.0%
United States	69.0	5.0	No data	65.0%
Europe (Belgium, Estonia, France, Germany, Hungary, Italy, Netherlands, Poland, Romania, Spain, United Kingdom)	64.2	4.6	79.3	53.4%

Source: Kailee Hilt.

information on six of the 14 low-income countries related to AI capacity, so it is hard to generalize. In contrast, lower-middle-income countries had better scores on capacity and had higher levels of internet access. Most countries in this sample also had some form of AI capacity, although information was lacking on four of the 14 countries in this group. Upper-middle-income countries had even higher scores on metrics of human capacity and of internet access. Most of these higher-income states also had AI labs. Information was unavailable for four of the 14 states.

Next, a wide range of governance metrics were examined, specifically related to the ease of doing business, regulatory governance and statistical capacity. There was a lot of variation in state performance on these metrics among income classes. Some poorer developing countries were relatively strong on statistical capacity. In general, richer countries tended to do better on the ease of doing business scores. However, commodity exporters such as Gabon and Equatorial Guinea were prominent exceptions — they were clearly not as well-governed. Thus, wealth did not necessarily correlate with good performance on regulatory governance.

Finally, the analysis turned to data governance. Specifically, it examined if the country under review had a government-sponsored plan for AI, laws and regulations on personal data protection, and a government-sponsored plan for open data. Such plans indicate that the country viewed governance of data as a priority for its future.

The data showed that wealthier countries were more likely to have an AI plan, but wealthier countries did not have higher scores on open data or on internet freedom. In general, democratic countries had more open data and an open internet. However, these sources did not cover all the countries in the sample; hence, it is not possible to generalize about these relationships.

A Brief Look at the Potential Dilemmas of Data Governance for all Countries

As noted in an earlier paper by this author, policy makers need to interact with data-driven firms and their stakeholders in order to effectively regulate data and data-driven activity (Aaronson 2018). Yet many developing countries do not have such firms. Nonetheless, these states are under mounting pressure to govern data effectively. Kenya and Zimbabwe provide contrasting examples of how states are responding to this pressure.

Kenya has a vibrant and growing digital economy. The government is implementing a digital identity program — storing the fingerprints, eyes, faces, voices, DNA and location of its 50 million citizens. The government argues it will then use that data to provide cost-effective public services. Every Kenyan over the age of six will receive a unique identification number known as Huduma Namba — or "service number." The plan has alarmed digital advocates and civil libertarians who have said it raises questions over human rights, ethics and possible breaches of privacy. Because Kenya does not have an online data protection law, critics fear the strategy could create significant problems. They have argued that it could lead to the denaturalization of millions of Kenyans, make it easier for government officials to misuse or abuse personal information collected by state agencies or third parties and necessitate the surrender of personal information to access constitutionally guaranteed services (Dahir 2019; UNCTAD 2018). But the digitally savvy Kenyan human rights community swung into action and demanded that the government make data protection a priority. Consequently, the legislature is considering a new personal data-protection law as the plans for the identity program move ahead[18] (Mweu 2018).

Zimbabwe, in comparison, has a less active digital economy and weaker human rights protections. Like Kenya, it does not yet have a specific data protection law. The Access to Information and

18 See Ministry of Information, Communications and Technology (2018).

Protection of Privacy Act (chapter 10, 247) contains provisions on data protection, but it generally only regulates the use of personal data by public bodies (DLA Piper 2019). In contrast with Kenya, the Zimbabwean government has a long history of spying on its citizens and disrespecting their rights. In 2018, the government signed a strategic cooperation framework agreement with a Chinese start-up, CloudWalk Technology, for a large-scale facial recognition program. Zimbabwe will export a database of its citizens' faces to China, allowing CloudWalk to improve its underlying algorithms with more data. The government allegedly agreed to the system because it wanted to improve public safety, while the company wanted to improve the accuracy of its facial recognition system, which was based on Chinese faces and needed a wider range of facial types. However, the government of Zimbabwe could use this system to more closely monitor its citizens, which could undermine social stability and trust (Hogarth 2018; Jie 2018). Although some Zimbabweans are deeply concerned about the framework agreement, it has not led Zimbabwe to develop and debate a strategy for protecting personal data.

Meanwhile, even the most data-sophisticated nations such as the United States are struggling to govern data. Many of the largest data-driven firms were created and are headquartered in the United States. US companies are also cutting-edge innovators in data-driven sectors — personalized health care, autonomous vehicles and personal assistants such as Siri or Alexa. Meanwhile, a growing number of US manufacturers are transitioning to this new economy, by using data to provide tailored goods and new services to their consumers (smart manufacturing).

Yet America's prowess in data is not matched by leadership in data governance at the international and national levels. The United States has long tried to influence global data governance. Since the Obama administration, it has proposed binding language in several regional and international agreements to make the free flow of data a default, with limited exceptions. But the United States dropped out of the Trans-Pacific Partnership agreement and Congress has yet to approve any such agreement with binding language; therefore, the United States is not setting the rules internationally.[19] Meanwhile, at the national level, the United States still has no federal online data protection law (Stacy 2019). The administration of Donald Trump has put forward and sought comments on a Federal Data Strategy but it has not engaged the broader public in a discussion of how public and proprietary data can be mixed, how and when various types of data can be shared online, and whether governments should provide information in machine readable and/or plain language formats. In contrast, as noted above, Canada has consulted with its citizens on both the domestic and international governance of data and in so doing has fostered trust as Canada transitions to the data-driven economy.

Trust between regulators, firms and consumers must be embedded in any domestic or international strategy to govern data. Japanese Prime Minister Shinzo Abe acknowledged the import of trust for effective data governance in a January 2019 speech to the World Economic Forum, where he called for "data free flow with trust." He noted, "We must, on one hand, be able to put our personal data and data embodying intellectual property, national security intelligence, and so on, under careful protection, while on the other hand, we must enable the free flow of medical, industrial, traffic and other most useful, non-personal, anonymous data to see no borders, repeat, no borders" (Abe 2019).

Abe pushed for other members of the G20 to agree to his "data free flow with trust" plan at its June 2019 meeting in Osaka. Interestingly, China and Russia, two nations that restrict cross-border data flows, signed a statement of support. However, India, South Africa and Indonesia refused to sign it, arguing that they must first develop their own national plans for data in order to use data as a means for development (Sugiyama 2019; Delval 2019; Jalan 2019).

Conclusion and Final Thoughts

If development is a means to improve the lives of the poor, and data-driven sectors could help achieve growth, developing countries need a better understanding of the costs and benefits of their regulatory choices for data. In general wealthier countries were more likely to have expertise

19 See https://strategy.data.gov/action-plan/.

and to take steps toward building a data-driven economy. They provided more open data and had data governance plans. Most developing countries, however, were not well-positioned to transition toward the data-driven economy and will struggle to catch up. Some observers have argued that because of this disparity, the world will be divided between countries that are exporters of data value-added products and services and those that import these services. These importing countries will, in the end, have little control over the use of their public and private data (Weber 2017; Pisa and Polcari 2019; Pinto 2018). In recognition of this potentially dangerous future, UNCTAD warned in 2017 that "International support and collaboration on a massive scale is needed to prevent the evolving digital economy from leading to widening digital divides and greater income inequalities, and to ensure that more people and enterprises in developing countries have the capacity to participate effectively in it. The international community will need to expand its support on a massive scale....The share of ICT in total aid for trade declined from 3 per cent in 2002–2005 to only 1.2 per cent in 2015" (UNCTAD 2017b, 8). In a separate analysis, the International Labour Organization stressed that if the benefits from data are to be broadly shared, governments must adopt skills policy, prevent market concentration, ensure proper data protection and privacy, and help share the benefits of productivity growth through a combination of profit sharing, (digital) capital taxation and a reduction in working time (Ernst, Merola and Samaan 2018). To put it differently, countries will need to broadly rethink how, when and where they regulate data.

What Should Happen? Some Ideas

The World Bank, the WTO and UNCTAD have spent years trying to help developing countries build e-commerce capacity and governance (Reiss 2016; Frederickson 2016; UNCTAD 2017a).[20] However, these organizations seem to have focused their training on traditional e-commerce; they have not prepared countries for the panoply of ethical, social, economic and political issues that regulators must address when discussing new data-driven services such as AI. These organizations could more effectively help all countries transition to the data-driven economy if they collaborated on these three steps:

Encourage states to develop plans for the regulation and exchange of different types of data. Every nation should develop a strategy for how public and personal data is to be used and exchanged across borders (a national data plan). The plan should focus on ensuring that public data is open and personal data, especially personally identifiable data,[21] is adequately protected.

Such a plan should address issues of ownership, control, portability, equity (is the data developed and analyzed in an even-handed manner?) and monetization of data (who can earn money for data and how). Policy makers will also have to address issues related to the cloud and data transfer — how a country can control the transfer of data that might include personally identifiable information or data that is important for national security (Scassa 2018). Such plans should also address how firms can mix various types of data while protecting personal data and metadata, as well as address questions of what entities can monetize the results of the mixture of personal, proprietary and public data. Each country will need to evolve strategies that allow policy makers to maintain trust online consistent with their norms for governance.

Encourage experimentation through technical assistance, regulatory sandboxes and collaboration. For most states, developing such a plan will not be easy. Countries should help one another. Policy makers will need guidelines, incentives and technical assistance. The Digital 9 (D9) states might provide a road map (the D9 countries include Canada, Estonia, Israel, Mexico, New Zealand, Portugal, South Korea, the United Kingdom and Uruguay). These states are not only rethinking governance for the digital age, but they are also using the digital age to become better at governance. They are committed to sharing world-class digital practices and collaborating to solve common problems.[22] These states could test out regulations (regulatory sandboxes) and help provide other states with information on how to regulate in ways that can achieve more equitable development outcomes built on data.

20 See www.wto.org/english/tratop_e/ecom_e/ecomdevel_e.htm.

21 Personally identifiable information is information that can be used to identify, contact or locate a single person, or to identify an individual in context.

22 See www.digital.govt.nz/digital-government/international-partnerships/the-digital-9/.

Study a data-development rethink? Finally, development agencies and advocates need to wrestle with important questions about data-driven growth. On one hand, facilitating digital development could help developing countries diversify while retaining their educated workforce (Mora 2016). On the other hand, policy makers in these countries have geared their development strategies toward developing a diversified economy built on the export of goods and more traditional services. Development agencies such as the World Bank and the Canadian International Development Agency should examine if countries should move toward a broad development policy rethink, given the rising import and value of data.

Author's Note

I am grateful to the anonymous reviewers for CIGI and colleagues at the Kennedy School of Government, Harvard University and the Center for Global Development, Washington, DC, for their suggestions for improvement when I presented the paper.

Works Cited

Aaronson, Susan Ariel. 2017. *Information Please: A Comprehensive Approach to Digital Trade Provisions in NAFTA 2.0*. CIGI Paper No. 154. Waterloo, ON: CIGI. www.cigionline.org/publications/information-please-comprehensive-approach-digital-trade-provisions-nafta-20.

———. 2018. *Data Is Different: Why the World Needs a New Approach to Cross-border Data Flows*. CIGI Paper No. 197. Waterloo, ON: CIGI. www.cigionline.org/publications/data-different-why-world-needs-new-approach-governing-cross-border-data-flows.

Aaronson, Susan Ariel and Patrick LeBlond. 2018. "Another Digital Divide: The Rise of Data Realms and its Implications for the WTO." *Journal of International Economic Law* 21 (2): 245–72. https://doi.org/10.1093/jiel/jgy019.

Abe, Shinzo. 2019. "Speech by Prime Minister Abe at the World Economic Forum Annual Meeting: Toward a New Era of 'Hope-Driven Economy.'" January 23. www.mofa.go.jp/ecm/ec/page4e_000973.html.

Bhattacharjee, Sankalpa and Chakrabartib, Debkumar. 2015. "Investigating India's competitive edge in the IT-ITES sector." *IIMB Management Review* (1): 19–34. https://reader.elsevier.com/reader/sd/pii/S09703896 1500004X?token=BDA40BA2E7BE5 BF7E705CC02C55E C65594C992074575 121992DB4925FE7292F44A3 5291C7DC3386DEE855816CC4C6050.

BSA. 2018. "2018 BSA Global Cloud Computing Scorecard: Powering a Bright Future." https://cloudscorecard.bsa.org/2018/.

Burri, Mira. 2017. "The Regulation of Data Flows Through Trade Agreements." *Georgetown Journal of International Law* 48 (1): 407–45.

Caribou Digital. 2016. *Winners and Losers in the Global App Economy*. www.cariboudigital.net/wp-content/uploads/2019/01/Caribou-Digital-Winners-and-Losers-in-the-Global-App-Economy-2016.pdf.

Cesar, Max, Alberto Chaia, Andre de Oliveira Vaz, Gonzalo Garcia-Muñoz and Philipp Haugwitz. 2018. "How Mexico can become Latin America's digital-government powerhouse." www.mckinsey.com/business-functions/digital-mckinsey/our-insights/how-mexico-can-become-latin-americas-digital-government-powerhouse.

Chakravorti, Bhaskar, Ajay Bhalla and Ravi Shankar Chaturvedi. 2017. "60 Countries' Digital Competitiveness Indexed." *Harvard Business Review*, July. https://hbr.org/2017/07/60-countries-digital-competitiveness-indexed.

Ciuriak, Dan. 2018. "The Economics of Data: Implications for the Data-driven Economy." In *Data Governance in the Digital Age*. Waterloo, ON: CIGI. www.cigionline.org/publications/data-governance-digital-age.

Cohen, Erez. 2019. "How Globalisation Impacted Israel and India Differently in the 1990s." *Economic Affairs* 39 (1): 115–26. http://dx.doi.org/10.1111/ecaf.12336.

Dahir, Abdi Latif. 2019. "Kenya's plan to store its citizens' DNA is facing massive resistance." Quartz Africa, February 21. https://qz.com/africa/1555938/kenya-biometric-data-id-not-with-mastercard-but-faces-opposition/.

Datatilsynet. 2018. *Artificial Intelligence and Privacy*. January. www.datatilsynet.no/globalassets/global/english/ai-and-privacy.pdf.

Delval, Galaad. 2019. "China pushes for approval-based cross-border transfer of personal informationoverseas." International Association of Privacy Professionals, June 25. https://iapp.org/news/a/china-pushes-for-an-approval-based-cross-border-transfer-of-personal-information-overseas/.

Desjardins, Jeff. 2018. "Visualizing The World's 20 Largest Tech Giants." Visual Capitalist, July 6. www.visualcapitalist.com/visualizing-worlds-20-largest-tech-giants/.

Di Ionnoy, Michelle and Michael Mandel. 2016. "The Rise of the Mexican App Economy." Progressive Policy Institute, August. www.progressivepolicy.org/wp-content/uploads/2016/08/The-Rise-of-the-Mexican-App-Economy.pdf.

DLA Piper. 2019. *Data Protection Laws of the World Handbook*. www.dlapiperdataprotection.com/.

Drake, William J. 1993. "Territoriality and Intangibility: Transborder Data Flows and National Sovereignty." In *Beyond National Sovereignty: International Communications in the 1990s*, edited by Kaarle Nordenstreng and Herbert I. Schiller, 259–313. Norwood, NJ: Ablex.

———. 2018. "Data Localization and Barriers to Cross-Border Data Flows: Towards a Multitrack Approach." World Economic Forum.

Eaves, David and Ben McGuire. 2019. "The first decade of open data has been a win — but not for the reasons you think." Apolitical, January 4. https://apolitical.co/solution_article/the-first-decade-of-open-data-has-been-a-win-but-not-for-the-reasons-you-think/?mc_cid=18096eb02f&mc_eid=d6ed88c5ef.

eBay Inc. 2013. *Commerce 3.0 for Development*. www.ebaymainstreet.com/sites/default/files/eBay_Commerce-3-for-Development.pdf.

Economist Intelligence Unit. 2016. *Democracy Index 2015: Democracy in an age of anxiety*. www.yabiladi.com/img/content/EIU-Democracy-Index-2015.pdf.

Ernst, Ekkehard, Rossana Merola and Daniel Samaan. 2018. "The Economics of Artificial Intelligence: Implications for the Future of Work." ILO Future of Work Research Paper Series No. 5. www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_647306.pdf.

Frederickson, Torjbörn. 2016. "Unlocking the Development Potential of e-Commerce: The role of eTrade for All." Presentation at Seminar on eCommerce for Development, Geneva, December 9. www.wto.org/english/tratop_e/ecom_e/s1torbjorn_unctad.pdf.

Girot, Clarisse, ed. 2018. *Regulation of Cross-border Transfers of Personal Data in Asia*. Asian Business Law Institute. https://cis-india.org/internet-governance/files/dp-compendium.

Golobski, Christina. 2018. "Africa in Focus: Capitalizing on Industry 4.0 in Africa." The Brookings Institution, July 3. www.brookings.edu/blog/africa-in-focus/2018/07/03/capitalizing-on-industry-4-0-in-africa/.

Government of Canada. 2019a. "Canada's Digital Charter: Trust in a digital world." Innovation, Science and Economic Development Canada, May. www.ic.gc.ca/eic/site/062.nsf/eng/h_00108.html.

———. 2019b. "Canada's Digital Charter in Action: A Plan by Canadians, for Canadians." Innovation, Science and Economic Development Canada, May. www.ic.gc.ca/eic/site/062.nsf/eng/h_00109.html.

Government of India. 2019. "Draft National e-Commerce Policy: India's Data for India's Development." Department for Promotion of Industry and Internal Trade, Februay 23. https://dipp.gov.in/sites/default/files/DraftNational_e-commerce_Policy_23February2019.pdf.

Gurry, Francis. 2018. "Artificial intelligence and intellectual property: an interview with Francis Gurry." *WIPO Magazine*, September. www.wipo.int/wipo_magazine/en/2018/05/article_0001.html.

Herold, David Kurt. 2011. "An Inter-Nation-al Internet: China's Contribution to Global Internet Governance?" September 5. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1922725.

Hogarth, Ian. 2018. "AI Nationalism." I*an Hogarth* (blog), June 13. www.ianhogarth.com/blog/2018/6/13/ai-nationalism

Hong, Yanqing. 2017. "The Cross-Border Data Flows Security Assessment: An Important Part of Protecting China's Basic Strategic Resources." Working Paper. Yale Law School Paul Tsai China Center. http://apide.org/apru-asia-eu-dialogue/readings/CrossBorderDataFlows.pdf.

Jalan, Trisha. 2019. "India boycotts Osaka Track, says global talks on digital economy should be held within WTO." Medianama, July 1. www.medianama.com/2019/07/223-india-boycotts-osaka-track/.

Jie, Shan. 2018. "China exports facial ID technology to Zimbabwe." *Global Times*, April 12. www.globaltimes.cn/content/1097747.shtml.

Kanth, D. Ravi. 2019. "India, South Africa, others skip WTO negotiations on e-commerce at Davos meet." Live Mint, January 25. www.livemint.com/politics/news/india-south-africa-others-skip-wto-negotiations-on-e-commerce-at-davos-meet-1548435856765.html.

Lee, Kai-Fu. 2018. *AI Super-Powers: China, Silicon Valley, and the New World Order*. Boston, MA: Houghton Mifflin.

Leetaru, Kalev. 2019. "Why Is AI and Machine Learning So Biased? The Answer Is Simple Economics." *Forbes*, January 20. www.forbes.com/sites/kalevleetaru/2019/01/20/why-is-ai-and-machine-learning-so-biased-the-answer-is-simple-economics/#7e4bd12e588c.

Lindstedt, Catharina and Daniel Naurin. 2010. "Transparency Is Not Enough: Making Transparency Effective in Reducing Corruption." *International Political Science Review* 31 (3): 301-2. https://doi.org/10.1177/0192512110377602.

McKinsey & Company. 2017. *Artificial Intelligence and Southeast Asia's Future*. McKinsey Global Institute. www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Artificial%20Intelligence/AI%20and%20SE%20ASIA%20future/Artificial-intelligence-and-Southeast-Asias-future.ashx.

Meltzer, Joshua P. 2018. "The Impact of Artificial Intelligence on International Trade." The Brookings Institution, December 13. www.brookings.edu/research/the-impact-of-artificial-intelligence-on-international-trade/.

Ministry of Information, Communications and Technology. 2018. "The Data Protection Bill, 2018: Arrangement of Clauses." Government of Kenya. www.ict.go.ke/wp-content/uploads/2016/04/Kenya-Data-Protection-Bill-2018-14-08-2018.pdf.

Monicken, Hannah. 2019. "US, China, over 70 others announce 'intent' to launch e-commerce talks." *Inside US Trade*, January 31. https://insidetrade.com/inside-us-trade/us-china-over-70-others-announce-intent-launch-e-commerce-talks.

Mora, Alexander. 2016. "Remarks by the Minister of Foreign Trade of Costa Rica, Mr. Alexander Mora." Seminar on eCommerce for Development, Geneva, December 9. www.wto.org/english/tratop_e/ecom_e/iialexandermora.pdf.

Mweu, Nzilani. 2018. "Data Protection in Kenya: Overview." Thompson Reuters Practical Law. https://uk.practicallaw.thomsonreuters.com/w-014-1015?transitionType=Default&contextData=(sc.Default)&firstPage=true&comp=pluk&bhcp=1.

Network Asia. 2016. "Companies increasingly perceive data as a strategic resource." www.networksasia.net/article/companies-increasingly-perceive-data-strategic-resource.1453255125.

Newman, Steph. 2019. "What is metadata? What is personal data?" NewsMediaWorks, March 15. https://newsmediaworks.com.au/what-is-metadata-what-is-personal-data/.

OECD. 2015. "Data-Driven Innovation for Growth and Well-Being: What Implications for Governments and Businesses?" STI Policy Note. October. www.oecd.org/sti/ieconomy/PolicyNote-DDI.pdf.

Office of the Privacy Commissioner of Canada, 2014. *Metadata and Privacy: A Technical and Legal Overview*. October. www.priv.gc.ca/media/1786/md_201410_e.pdf.

Onifade, Akin. 2018. "How Prepared Are We for the 4th Industrial Revolution — A Case Study in Africa Part II." *Business Day*, July 5. www.businessdayonline.com/news/article/prepared-4th-industrial-revolution-case-study-africa-part-ii/.

Pinto, Renata Avila. 2018. "Digital Sovereignty or Digital Colonialism?" *Sur International Journal on Human Rights* 27. https://sur.conectas.org/en/digital-sovereignty-or-digital-colonialism/.

Pisa, Michael and John Polcari. 2019. "Governing Big Tech's Pursuit of the 'Next Billion Users.'" Center for Global Development Policy Paper 138, February. www.cgdev.org/sites/default/files/governing-big-techs-pursuit-next-billion-users.pdf.

Popescu, Adam. 2016. "Is Mexico the Next Silicon Valley? Tech Boom Takes Root in Guadalajara." *The Washington Post*, May 14. www.washingtonpost.com/business/is-mexico-the-next-silicon-valley-tech-boom-takes-root-in-guadalajara/2016/05/13/61249f36-072e-11e6-bdcb-0133da18418d_story.html?utm_term=.04129fbe0c70.

Ransbotham, Sam. 2015. "Secrets in the Age of Data." *MIT Sloan Management Review*, September 29. https://sloanreview.mit.edu/article/secrets-in-the-age-of-data/.

Reinsel, David, John Gantz and John Rydning. 2018. "The Digitization of the World from Edge to Core." November. www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-dataage-whitepaper.pdf.

Reiss, Jose Guilherme. 2016. "Digital Dividends and Prospects for Developing Countries and LDCs." Presentation at Seminar on eCommerce for Development, Geneva, December 9. www.wto.org/english/tratop_e/ecom_e/s1joseg_worldbank.pdf.

Sacks, Samm. 2018. "China's Emerging Data Privacy System and GDPR." Center for Strategic & International Studies. March 9. www.csis.org/analysis/chinas-emerging-data-privacy-system-and-gdpr.

Scassa, Teresa. 2018. "Considerations for Canada's National Data Strategy." In *Data Governance in the Digital Age.* Waterloo, ON: CIGI. www.cigionline.org/sites/default/files/documents/Data%20Series%20Special%20Reportweb.pdf.

Stacy, Kiran. 2019. "Senate talks on US data privacy law grind to a halt." *The Financial Times*, June 11. www.ft.com/content/ecbc11d0-8bad-11e9-a24d-b42f641eca37.

Sugiyama, Satosi. 2019. "Abe heralds launch of 'Osaka Track' framework for free cross-border data flow at G20." *The Japan Times*, June 28. www.japantimes.co.jp/news/2019/06/28/national/abe-heralds-launch-osaka-track-framework-free-cross-border-data-flow-g20/.

TechNative. 2018. "Data Quality vs Data Quantity: What's More Important for AI?" TechNative, November 1. www.technative.io/data-quality-vs-data-quantity-whats-more-important-for-ai/.

The Economist. 2016. "Taming the beasts." *The Economist*, May 28. www.economist.com/business/2016/05/28/taming-the-beasts.

———. 2019. "A new initiative aims to modernize global trading rules." *The Economist*, January 31. www.economist.com/finance-and-economics/2019/01/31/a-new-initiative-aims-to-modernise-global-trading-rules.

UNCTAD. 2017a. "Friends of E-commerce for Development Launch Roadmap for International Trade and Development Policy." May 4, https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1477.

———. 2017b. "Information Economy Report 2017: Digitalization, Trade and Development." Geneva, Switzerland: United Nations. https://unctad.org/en/PublicationsLibrary/ier2017_overview_en.pdf.

———. 2018. "UNCTAD B2C E-commerce Index 2018: Focus on Africa." UNCTAD Technical Notes on ICT for Development No. 12. https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d12_en.pdf.

Verhulst, Stefaan and Andrew Young. 2017. *Open Data in Developing Economies: Toward Building an Evidence Base on What Works and How.* Capetown, South Africa: African Minds.

Weber, Steven. 2017. "Data, Development and Growth." *Business and Politics* 19 (3): 397–423. www.cambridge.org/core/services/aop-cambridge-core/content/view/DC04765FB73157C8AB76AB1742ECD38A/S1469356917000039a.pdf/data_development_and_growth.pdf.

World Bank. n.d. "Global Indicators of Regulatory Governance: Trends in Participatory Rulemaking: A Case Study." http://pubdocs.worldbank.org/en/288511511216658101/GIRG-Case-Study-Trends-in-Participatory-Rulemaking.pdf.

———. 2016. *World Development Report 2016: Digital Dividends*. Washington, DC: World Bank.

———. 2018. *Information and Communications for Development: Data-Driven Development.* www.worldbank.org/en/topic/digitaldevelopment/publication/data-driven-development.

World Economic Forum. 2017. *The Global Human Capital Report 2017*. www3.weforum.org/docs/WEF_Global_Human_Capital_Report_2017.pdf.

World Policy. 2013. "The Big Question: What Should Governments Keep Secret?" September 12. https://worldpolicy.org/2013/09/12/the-big-question-what-should-governments-keep-secret/.

WTO. 2018. World Trade Report: The Future of World Trade: — How Digital Technologies Are Transforming Global Commerce. September. Geneva, Switzerland: WTO.

———. 2019. "Joint Statement on Electronic Commerce, Communication from the United States." INF/ECOM/23. April 26.

Zwetsloot, Remco, Helen Toner and Jeffrey Ding. 2018. "Beyond the AI Arms Race: Review Essay." *Foreign Affairs*, November 16. www.foreignaffairs.com/reviews/review-essay/2018-11-16/beyond-ai-arms-race.

About CIGI

We are the Centre for International Governance Innovation: an independent, non-partisan think tank with an objective and uniquely global perspective. Our research, opinions and public voice make a difference in today's world by bringing clarity and innovative thinking to global policy making. By working across disciplines and in partnership with the best peers and experts, we are the benchmark for influential research and trusted analysis.

Our research initiatives focus on governance of the global economy, global security and politics, and international law in collaboration with a range of strategic partners and have received support from the Government of Canada, the Government of Ontario, as well as founder Jim Balsillie..

À propos du CIGI

Au Centre pour l'innovation dans la gouvernance internationale (CIGI), nous formons un groupe de réflexion indépendant et non partisan doté d'un point de vue objectif et unique de portée mondiale. Nos recherches, nos avis et nos interventions publiques ont des effets réels sur le monde d'aujourd'hui car ils apportent de la clarté et une réflexion novatrice pour l'élaboration des politiques à l'échelle internationale. En raison des travaux accomplis en collaboration et en partenariat avec des pairs et des spécialistes interdisciplinaires des plus compétents, nous sommes devenus une référence grâce à l'influence de nos recherches et à la fiabilité de nos analyses.

Nos projets de recherche ont trait à la gouvernance dans les domaines suivants : l'économie mondiale, la sécurité et les politiques internationales, et le droit international. Nous comptons sur la collaboration de nombreux partenaires stratégiques et avons reçu le soutien des gouvernements du Canada et de l'Ontario ainsi que du fondateur du CIGI, Jim Balsillie.

Centre for International
Governance Innovation

67 Erb Street West
Waterloo, ON, Canada N2L 6C2
www.cigionline.org

@cigionline